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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/672,968

09/25/2003

Peter G. Tolchinsky

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3614

8791

7590

04/19/2005

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EXAMINER

WILSON, CHRISTIAN D

ART UNIT

PAPER NUMBER

2891

DATE MAILED: 04/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/672,968	<b>Applicant(s)</b> TOLCHINSKY ET AL.	
	<b>Examiner</b> Christian Wilson	<b>Art Unit</b> 2891	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).. Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 22 March 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) 18-30 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-17 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 September 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>09252003</u> | 6) <input checked="" type="checkbox"/> Other: <u>search history</u> .                   |

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Claims 18 – 30 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim.

Election was made **without** traverse in the reply filed on March 22, 2005. In the restriction mailed on February 18, 2005, claims 18 – 24 were incorrectly grouped with the method claims of 1 – 17. In a phone call on April 12, 2005 with Heather Molleur, it was agreed that the device claims of 18 – 24 would be grouped with the withdrawn claims.

### ***Drawings***

2. The drawings are objected to because they contain hand drawn figures and label numbers. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as “amended.” If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either “Replacement Sheet” or “New Sheet” pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will

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be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Official Notice***

3. Official notice is taken that silicon carbide (SiC) has a thermal conductivity that is greater than the thermal conductivity of silicon (Si). This is supported by the applicant's specification [0023] and Hummel (*Electronic Properties of Materials*) [Table 19.3].

***Claim Rejections - 35 USC § 102***

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1 – 7 and 10 – 13 are rejected under 35 U.S.C. 102(b) as being anticipated by Kub *et al.*

Kub *et al.* (US 6,323,108) discloses a process comprising providing a semiconductor substrate 10 and coupling the substrate directly to a bulk heat dissipation [column 4, lines 43-44] substrate 18 having a thermal conductivity greater than that of the substrate.

Regarding claim 2, Kub *et al.* further discloses a bulk heat dissipation substrate of SiC [column 6, line 59].

Regarding claim 3, Kub *et al.* further discloses a bulk heat dissipation substrate which is a material that removes heat from the semiconductor substrate [column 6, lines 60-67].

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Regarding claim 4, Kub *et al.* further discloses forming a splitting layer 12 within the semiconductor substrate, bonding the substrate chemically to the bulk heat dissipation substrate [column 6, lines 32-37], and splitting the substrate along the splitting layer [column 6, line 41].

Regarding claims 5 and 6, Kub *et al.* further discloses forming the splitting layer by implanting hydrogen in the semiconductor substrate [column 5, lines 55-65].

Regarding claim 7, Kub *et al.* further discloses bonding the substrate chemically to the bulk heat dissipation substrate and grinding back the semiconductor substrate [column 1, line 30].

Regarding claims 10 – 13, Kub *et al.* further discloses forming a transition layer on the bulk heat dissipation substrate which is silicon nitride or polysilicon [column 7, lines 5-10] and then bonding the transition layer to the substrate [Figure 1B].

### ***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kub *et al.* in view of Ghyselen *et al.*

Kub *et al.* teaches the limitations of claim 1 above but does not discuss depositing the bulk heat dissipation substrate by chemical vapor deposition (CVD). Ghyselen *et al.* (US 6,867,067) teaches a CVD method to deposit a SiC substrate [column 6, lines 60-65]. It would have been obvious to one of ordinary skill in the art to use the CVD method of Ghyselen *et al.* in

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the method of Kub *et al.* since this method provides a low temperature method of depositing a SiC substrate as taught by Ghyselen *et al.*

8. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kub *et al.*

Kub *et al.* teaches the limitations of claim 13 as describe above including bonding by heating the semiconductor substrate and bulk heat dissipating substrate [column 8, line 60].

Kub *et al.* also discusses forming weak bonds between the surface of the semiconductor substrate and the transition layers [column 7, line 65 – column 8, line 10]. It would have been obvious to one of ordinary skill in the art to form weak bonds between the polysilicon layer and semiconductor substrate and then heat the polysilicon and semiconductor substrate to form covalent bonds since Kub *et al.* teaches that this process will improve the bond strength between the layer and substrate.

9. Claims 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kub *et al.* in view of Letertre *et al.*

Kub *et al.* teaches a process comprising providing a silicon wafer 10, implanting hydrogen in the semiconductor substrate [column 5, lines 55-65], depositing a SiC layer 18, and splitting the substrate along the implantation layer 12. Kub *et al.* does not discuss forming the SiC layer by CVD or polishing the silicon layer or SiC layer. Letertre *et al.* (US 6,815,309) teaches forming a 0.5 mm thick SiC layer and using CVD [column 6, line 62; column 7, line 3] and polishing the SiC and Si layers [column 6, lines 5-10]. It would have been obvious to one of ordinary skill in the art use the SiC layer of Letertre *et al.* with the polishing steps in the method of Kub *et al.* since this provides a Si and SiC layers by a typical deposition method with adjustable thicknesses which is compatible with further processing technologies.

10. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kub *et al.* and Letertre *et al.* as applied to claim 15 above, and further in view of Lam *et al.*

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Kub *et al.* as modified by Letertre *et al.* teach the limitations of claim 15 as described above, but they do not discuss the polished thickness of the SiC layer. Lam *et al.* (US 2005/0060115) teaches a 300 mm wafer which has a final thickness of 0.775 mm [0006]. It would have been obvious to one of ordinary skill in the art to polish the SiC layer to a thickness of between 0.75 mm and 0.8 mm since this is the industry standard thickness for 300 mm wafers.

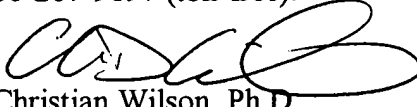
### ***Conclusion***

11. A copy of the search history (EAST and STN) is enclosed.
12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christian Wilson whose telephone number is (571) 272-1886.

The examiner can normally be reached on weekdays, 7:30 AM to 4 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Baumeister can be reached on (571) 272-1722. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Christian Wilson, Ph.D.  
Primary Examiner  
Art Unit 2891

CDW